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VIVIPARY IN CORDYLINE AUSTRALIS HOOK.

Howard J. Arnott

Vivipary is defined by Jackson (1928) as ". . . . germinating or sprouting from seed or bud, while attached to the parent plant." Examples of vivipary are known in a number of genera of both the monocotyledons and dicotyledons. The classical example of this condition occurs in such mangroves as *Rhizophora mangle* Blanco. In this species when the seed germinates while still attached to the parent plant, the hypocotyl-radical elongates, forming a long sharp structure (Daubenmire, 1947, fig. 10, p. 64). When this seedling structure becomes heavy enough, it breaks away from the parent plant and drops into the mud below. Because this sharp hypocotyl-radical structure penetrates the mud the seedling often becomes anchored and is prevented from being washed away from its environment, especially in the intertidal zone.

In the Agavaceae of Hutchinson, of which *Cordyline* is one member, several genera have been reported to show vivipary. Both *Agave* and *Furcraea* are included in this category. The viviparous condition in *Furcraea* is a great deal different than that of *Rhizophora* or *Cordyline*. In *Furcraea* at certain points along the inflorescence bulbils are formed. These bulbils (aerial deciduous buds) consist of a series of papery and photosynthetic bud scales surrounding a short axis and a shoot apex. These structures are often formed in enormous numbers and literally cover the ground when they abscise from the parent inflorescence. Bulbils begin to grow immediately when proper conditions prevail; plants produced in this manner have a very rapid rate of early growth.

In a cultivated plant of *Cordyline australis* Hook. growing in Berkeley, California, many cases of vivipary were observed. The bright-green young seedlings were easily seen protruding out of the white fruits. A total of over fifty separate fruits were found exhibiting this character.

In most cases the cotyledonary arch and the first leaf were all that could be seen of the seedling outside the fruit. Two cases were observed in

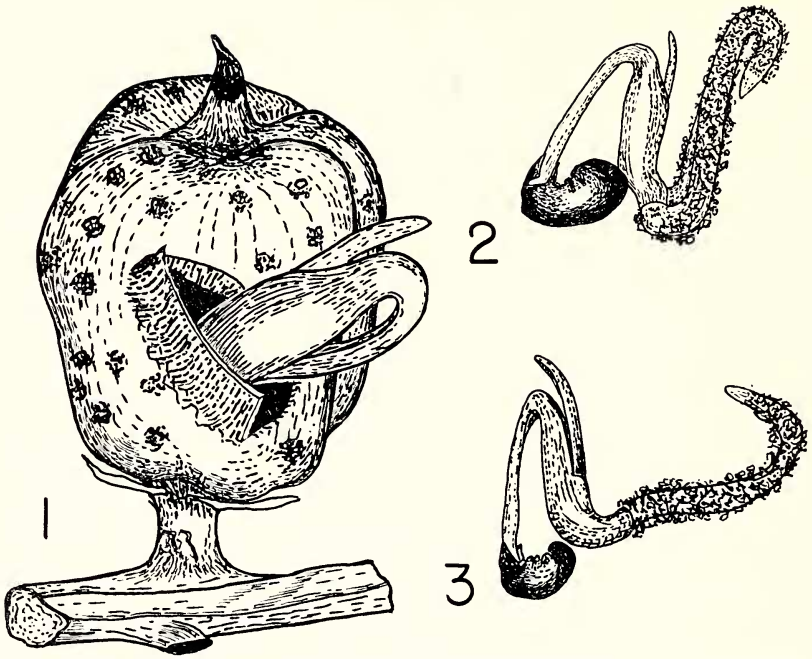

FIG. 1. Fruit of *Cordyline australis* Hook. showing a viviparous seedling protruding through the ruptured fruit wall. The fruit was still attached to the inflorescence. The densely stippled areas on the fruit represent the purple pigmented areas which normally occur on the white fruit of this species. × 9.

FIGS. 2 and 3. Seedlings dissected from viviparous fruits showing the seed, the cotyledon, the first leaf, and the primary root. The primary root is intimately associated with the internal tissues of the fruit (see text). × 4.

which the seed was pulled free of the fruit by the elongation and straightening of the cotyledon. Figure 1 shows a fruit in which the "aerial" parts of the seedling have protruded through the fruit wall. This protrusion was effected by a rupture of the tissues which enclosed the seed. The area surrounding the rupture seems to be at most only slightly discolored. In some cases dissection showed more than one seed to be present inside the fruit, but no cases of "multiple-vivipary" were found.

Figures 2 and 3 show seedlings dissected from "viviparous" fruits. The shiny black seed attached to the haustorial cotyledonary tip can be seen with the photosynthetic and sheathing parts of the cotyledon extending out in an inverted "U". Below the cotyledon is the axis and the primary root.

The most interesting point observed in these cases was the very intimate relationship between the internal tissues of the fruit and the primary root of the seedlings. This intimacy seems to be caused by the penetration of the internal fruit tissues by root hairs. When one tries to dissect these seedlings free of the fruit it is almost impossible to separate the primary

root from the internal tissues. It was not determined whether the root hairs grow between cell walls, into intercellular air spaces, or actually penetrate into the cells. The "fuzzy" appearance of the primary roots in figures 2 and 3 is an attempt to show this intimate association of the primary roots, root hairs, and internal fruit tissues after dissection.

One fact which seems to indicate that the root hairs are indeed the cause of this intimate association is that the root apex and some short distance behind it are completely free from any connection with the fruit tissues. This apparently is due to the absence of root hairs on such an immature part of the root.

Viviparous seedlings at a later stage than that shown in figure 1 have not been observed *in situ*. Such seedlings when removed from the fruit and placed on moist filter paper in a covered petri dish quickly show the production of new roots from the hypocotyl region. Apparently if these seedlings were planted they would produce normal plants.

While a number of cases of vivipary were found in this *Cordyline* plant, the number would be less than 0.1 per cent of the total number of fruits on the plant. One wonders what special physiological conditions were present in these viviparous fruits which caused or allowed the germination of these seeds. Also in the cases where more than one seed was present in a viviparous fruit, one wonders why only one seed germinated. One final question would be whether this condition occurs in this species in its native New Zealand, and what possible adaptive value might be found there for this condition, if it does occur.

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STUDIES ON SECOTIACEOUS FUNGI VI. SETCHELLIOGASTER POUZAR

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As a result of studying the types of *Secotium tenuipes* Setchell, and *Secotium aurantium* Zeller, we believe it is logical to group these two in a single genus as designated in our title. They have the following characters in common: their spores are some shade of rusty ochraceous, have an imperfect but often distinctly discontinuous pore-region, are elongate in shape, and smooth or ornamented by plugs of material filling canal-like passages through the wall. The hyphae bear clamp connections at the

[1] Papers from the University of Michigan Herbarium and the Department of Botany, No. 1086, University of Michigan, Ann Arbor, Michigan.